

UNITED STATES PATENT OFFICE

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METHOD AND COMPOSITION FOR DETECTING LEAKS IN REFRIGERATING SYSTEMS

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My invention relates to chemistry and more particularly to methods of testing apparatus suspected of leakage. It is especially concerned with methods of testing for 5 leaks in a refrigerating system of the compression type.

In refrigerating apparatus of the compression type, refrigeration is produced by the evaporation of a volatile liquid, the vapors being compressed in a compressor, condensed in a condenser and again permitted to evaporate within the evaporator. A lubricant is used within such apparatus for sealing and/or lubricating the wearing surfaces. 10 In some compression systems, the lubricant is deliberately carried throughout the complete cycle while in other systems, attempts are made to separate the lubricant from the refrigerant by means of an oil separator generally positioned on the high pressure side and designed to substantially prevent the passage of lubricant into the evaporator. Even in this last named system, some lubricant will pass the separator and will be carried along with the refrigerant through the complete cycle. Thus in all compression refrigerating systems, some lubricant will be present in all parts of the system at substantially all times.

It will be appreciated that it is essential for refrigerating apparatus to be quite free from leaks, even minute ones. Otherwise, either the refrigerant and/or lubricant will gradually escape, or else air will gradually leak into the apparatus. In either event, the apparatus will gradually produce less and less refrigerating effect, although it apparently is working perfectly in every other respect. Consequently, it is necessary that the apparatus be thoroughly subjected to tests which will show the existence of the smallest leak before such apparatus is installed and occasionally after the installation of such apparatus. It will also be appreciated that such tests must be of a simple nature for use in the field and inexpensive to perform, particularly where apparatus is manufactured under quantity production.

Many refrigerants are, however, quite difficult to detect because they do not react with

the well known and commercially available reagents to give either a color, fuming, or odor test. Examples of such refrigerants are the members of the halo-fluoro group, such as dichlorodifluoromethane, dichloromonofluoromethane, dichlorotetrafluoroethane, and such compounds as methyl chloride and isobutane.

It is to the ordinarily non-detectable refrigerants that my invention particularly relates, having for its objects a method of detecting leaks in a system employing such non-detectable refrigerants, without in any way diluting or otherwise affecting the properties of the refrigerants.

In carrying out my process for testing refrigerating apparatus for leaks, I make use of the property of basic dyes to permanently stain certain surfaces. For example, I have found that certain basic dyes such as methyl violet base, crystal violet, auramine B, rhodamine B, etc. have the property of permanently staining certain materials such as titanium oxide, silica, asbestos, mica, zinc oxide, magnesium oxide, frost, aluminum oxide, aluminum palmitate, and salts such as tri-basic calcium phosphate.

Thus, by coating the apparatus with a paint containing one or more of the above or similar substances, it is possible to obtain a permanent stain by permitting a basic dye to escape from the leaking apparatus.

As a specific example of one mode of carrying out my invention in a refrigerating system using CCl_2F_2 as the refrigerant and mineral oil as the lubricant, I dissolve a small amount of basic dye, such as methyl violet base, in the mineral oil. This solution is obtained by first dissolving the methyl violet base in alcohol or other suitable solvent and then mixing and stirring the solution with the mineral oil, or by mixing the methyl violet base directly with the lubricant and stirring the mixture. The refrigerating system is then charged with its usual amount of CCl_2F_2 and mineral oil having the methyl violet base dissolved therein.

The refrigerating apparatus, and particularly those parts where leaks are likely to occur, are painted with a paint such as Duco

containing titanium oxide, silica or any other substance stainable with methyl violet base.

Any leaks occurring in the apparatus will permit the escape of a small amount of mineral oil, and the methyl violet base escaping therewith will permanently stain the paint at the point of leakage.

The detection of leaks in the above specific example is aided by adding to the system a small amount of a powerful and pleasant perfume. The odor of the escaping perfume will indicate a leak which is then specifically detected by the stain.

After the leak has been detected and repaired, the stain may be removed by painting over with the paint.

The other basic dyes may be used by dissolving the dye in the oil in substantially the same manner.

Likewise, other materials, such as those indicated above, may be used for detecting purposes. For example, the entire refrigerating apparatus may be dipped in aluminium palmitate or the apparatus may be painted where leaks are likely to occur, with paint containing magnesium or aluminium oxide.

Also, any of the other halo-fluoro derivatives may be used as the refrigerant and, in fact, any refrigerant which does not have the property of bleaching the color deposited by the basic dye.

It will be apparent, therefore, that I have provided a very economical and simple test for leaks in a refrigerating system. By painting or otherwise treating the parts of the apparatus as manufactured or the apparatus as assembled, no additional apparatus is necessary for the process.

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Basic dyes as purchased on the market frequently contain dextrose or other substance for standardizing purposes. It is advisable to utilize in my method, a basic dye free of dextrose or other filler.

While I have disclosed various dyes, substances capable of being stained, refrigerants, and lubricants, it should be understood that my invention involves the use of a dye capable of permanently staining certain surfaces with any refrigerant that does not destroy the permanent color imparted to the stainable substance.

What is claimed is as follows:

1. In refrigerating apparatus using as a working fluid both a refrigerant and a lubricant, the method of detecting leaks which comprises dissolving a basic dye in the lubricant, treating the apparatus with a material stainable with the basic dye, and staining the material at the point of leakage.

2. In refrigerating apparatus using a halo-fluoro derivative of an aliphatic hydrocarbon as the refrigerant and an oil, the method of detecting leaks which comprises dissolving a basic dye in the lubricant, treating the apparatus with a material stainable with the basic dye, and staining the material at the leak.

3. A working fluid for refrigerating systems comprising a halo-fluoro derivative of an aliphatic hydrocarbon, a lubricant and a basic dye dissolved in the lubricant.

In testimony whereof I hereto affix my signature.

HARRY M. WILLIAMS.